PATENT SPECIFICATION

DRAWINGS ATTACHED

852,787

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International Classification: F06j,l.

Joining of pipes, tubes or similar hollow bodies.

COMPLETE SPECIFICATION

We, VEB INDUSTRIEWERK of Zwickauer Strasse 221, Karl-Marx-Stadt, Eastern Germany, a Company organised and existing under the laws of Eastern Germany, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:

The present invention relates to the joining of hollow members such as for example pipes and tubes. The invention has particular reference to pipe unions and screw pipe couplings, in which the surfaces of abutting pipe ends are pressed into direct sealing contact without an intervening member. The invention also has reference to flanged or screwed cover plates of casings, tanks, etc.

Compression joints are already known which comprise a taper extension pressed into sealing contact with a radial flange. The object of the taper extension is to provide a certain degree of resilience when the two members are pressed together. Joints of this kind have been known for a long time under the name of "diamond couplings". However, they suffer from various disadvantages. Among them is the fact that they must be made to extremely precise limits. If these are not observed the joint will not seal, or very high pressure must be applied to establish all-round sealing contact. This causes the surfaces of the diamond joint to be deformed so that without refitting it cannot be readily used again.

Compression joints are also known in which the co-operating parts which establish the seal are two contacting curved surfaces. A seal will not therefore be made unless the curved surfaces are very accurately matched because an all-round seal must be provided and, in a manner of speaking, two concentric sealing rings must be established between the co-operating parts.

The precision of workmanship of the sealing surfaces very considerably increases the cost of production of such compression couplings. To avoid the need of this expensive precision, and yet to form a reliable seal, even at high and extra high pressures and temperatures, the present invention provides a joint between two hollow members in which the surfaces of the members are pressed into direct sealing contact without an intervening member, characterised in that the end of one member is provided with a groove concentric with its bore and in which the inner surface of said groove has a slow taper in relation to its bore so as to form a slow taper annular spigot between the groove and the bore while the other surface of the groove is curved and wherein the end of the other member has a co-operating annular ridge for engagement in the annular groove of the first mentioned member.

A compression joint thus arranged can be machined in an ordinary manner. The efficacy of the seal, even when exposed to high pressures, is due to the fact that the joint has resilience although it is a compression type joint. The resilience of the joint makes precision work unnecessary.

The joint according to the invention may be so devised that the pipe end with the ridge also carries a thin radial flange with a sealing surface merging concavely into the outer surface of the ridge and making sealing contact with the abutting pipe end, the radius of said concave surface exceeding the radius of the cooperating convex surface.

The curved sealing surfaces which are tightly compressed by axial pressure first form an effective seal. At the same time a thrust directed radially inwards arises and tends to push the ridge radially inwards into close sealing contact with the spigot of the cooperating pipe. This spigot has a slow taper. Consequently, the further the end of the ridge is pressed into the groove the tighter will be the fit between spigot and

(Price 3s. 6d.)

ridge.

The surface at the extremity of the ridge inside the groove and cooperating with the inner surface of the groove may be formed either with a sharp angled edge or it may have a camber. However, this part of the ridge may also be formed with a shoulder in such a manner that the projecting shoulder facing the inner surface of the groove has a sharp edge. This sharp edge can then bite into the material of the cooperating surface, raising chips from the surface which can collect in the recess formed between the shoulder and the end of the ridge where their accumulation may have an additional sealing effect.

The fact that the spigot between the inner surface of the groove and the inside surface of the pipe is rather thin imparts a certain amount of elastic deformability to the spigot. This is an advantage when the ridge is pressed into the groove, because the thin spigot will then be able to yield.

On the other hand, the spigot can also yield when exposed to vary high pressures from inside the pipe and it will then be pressed into even closer contact with the cooperating ridge by the pressure inside the pipe or container.

According to another feature of the invention the arrangement of the joint may be such that the pipe end which is provided with the ridge and the thin radial flange has an annular recess near the end of the inside pipe surface, said recess reducing the thickness of the wall of the pipe at the root of the flange in such manner that when the union nut is tightened the flange and the adjoining ridge can elastically yield to the pressure, the ridge being forced inwards into closer sealing contact with the cooperating surface of the spigot.

Compression joints constructed in the manner that has been described are especially suited for use in conjunction with an appropriate kind of material in cases where high and maximum pressures and high temperatures must be contained. They form simple and reliable couplings.

Even at very high pressures the compressional force required for establishing the seal is not very considerable, so that major economies in the use of expensive materials can be secured by reducing the overall size of the structural parts.

The compression joint according to the invention will now be illustratively described with reference to the accompanying drawings in which:

Fig. 1 is a joint constructed according to the present invention,

Fig. 2 is an alternative construction,

Fig. 3 is a further alternative construction.

A union nut 1 holds two pipe ends 2 and 3 together. The nut may be replaced by other means for forcing the two pipe ends 2 and 3 together. The end face of pipe 3 has a deep groove 4 arranged concentrically with the inside surface 6 of the pipe, the inner surface 5 of the groove having a slow taper in relation to the inside pipe surface 6, thus forming an annular spigot 7. The cooperating end of pipe 2 has a projecting an annular ridge 8. The surfaces of the ridge are such that the surface 9, the point where the ridge projects furthest into the groove 4, will make sealing contact with the inside surface 5 of the groove 4. At the same time the concave surface 10 of the ridge 8 will make sealing contact with the convex surface 11 of groove 4.

Moreover, the end of pipe 2 is formed with a thin radial flange 12 embraced by the union nut 1. When the union nut 1 is tightened by means of engaging threads 13 the ridge 8 will be pressed into the groove 4, the ends of the two pipes 2 and 3 being then sealed by compressional contact between the two surfaces 10 and 11 and by the ridge 8 being forced into groove 4. The extremity of the ridge 8 inside groove 4 makes sealing contact with the inside surface 5 of groove 4, which has a slow taper in relation to the inside surface 6 of pipe 3. Therefore, a seal is formed at two different points, namely between the surfaces 10 and 11 and between the ridge 8 and the spigot 7. Extreme precision of the cooperating sealing surfaces is unnecessary because the seal between ridge 8 and the spigot 7 is of an elastic nature.

The shape of the extremity of ridge 8 which is forced into contact with spigot 7 may be varied. In Fig. 1 the end of the ridge has a sharp edge which makes a firm sealing joint with the material of the spigot 7. On the other end, in Fig. 2 the end is rounded and is likewise pressed into firm contact with the surface 5 of the spigot 7. However, in Fig. 3, the ridge 8 has a stepped shoulder. The projecting edge of the shoulder engages the surface 5 of the spigot 7. If the material is suitably soft the edge of the shoulder will bite into the material and cut chips from the same which are pushed downwards and collect in the recess below the shoulder between the extremity of the ridge and the spigot.

Moreover, an annular recess 14 may be provided inside the end of pipe 2. The presence of this recess reduces the wall thickness of pipe 2 at the root of flange 12. When the union nut 1 is tightened the flange 12 and the projecting ridge 8 can therefore be displaced inwardly with the result of increasing the area of contact with the taper surface 5 of spigot 7.

The thickness of the spigot 7 is sufficiently small to permit the spigot to yield. For instance, if the pressure applied by the ridge 8 to the spigot 7 becomes sufficiently

great, then the spigot will be able to yield. The formation of all-round sealing contact between the cooperating surfaces is thus assured. In the same way the spigot 7 can elastically deform outwardly, i.e. towards the ridge 8, whenever the pressure of the contained medium inside the pipes becomes sufficiently elevated. The spigot 7 will then be forced by the pressure inside the pipe into sealing contact with the cooperating surface of ridge 8.

WHAT WE CLAIM IS:

1. A joint between two hollow members in which the surfaces of the members are pressed into direct sealing contact, characterised in that the end of one member is provided with a groove concentric with its bore and in which the inner surface of said groove has a slow taper in relation to its bore so as to form a slow taper annular spigot between the groove and the bore while the other surface of the groove is curved and wherein the end of the other member has a co-operating annular ridge for engagement in the annular groove of the first mentioned member.

2. A pipe joint according to claim 1 wherein the ridge is so shaped that the extremity thereof is pressed into sealing contact with the other surface of the groove and the other surface of the ridge is simultaneously pressed into sealing contact with the curved surface of the groove.

3. A pipe joint as claimed in claim 2, characterised in that the end of the pipe with the ridge has a radial flange with a curved sealing surface merging into the ridge for making a sealing contact with the co-operating end of the other pipe and wherein the radius of the curvature of said surface is greater than the radius of curvature of a co-operating surface.

4. A pipe joint according to any of the claims 2 to 3 characterised in that the extremity of the ridge inside the groove has a sharp inner edge for co-operating with the inner surface of the groove.

5. A pipe joint as claimed in any of the preceding claims 2 to 3 characterised in that the extremity of the ridge inside the groove has a curved surface for co-operation with the inner surface of the groove.

6. A pipe joint as claimed in any of the preceding claims 2 to 3 characterised in that the extremity of the ridge inside the groove has a stepped shoulder for co-operation with the inner surface of the groove, the recessed portion below the shoulder, facing the inner flank of the groove having a sharp edge.

7. A pipe joint as claimed in any of the preceding claims 2—6, characterised in that the end of the pipe having the ridge and the thin radial flange has an annular recess near the end of the inside pipe surface, said recess reducing the thickness of the wall of the pipe at the root of the flange in such manner that when the joint is made the adjoining ridge can yield to the pressure.

8. Compression joint substantially as described and illustrated herein wtih reference to the accompanying drawings.

ERIC POTTER & CLARKSON,
Chartered Patent Agents.

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852787 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

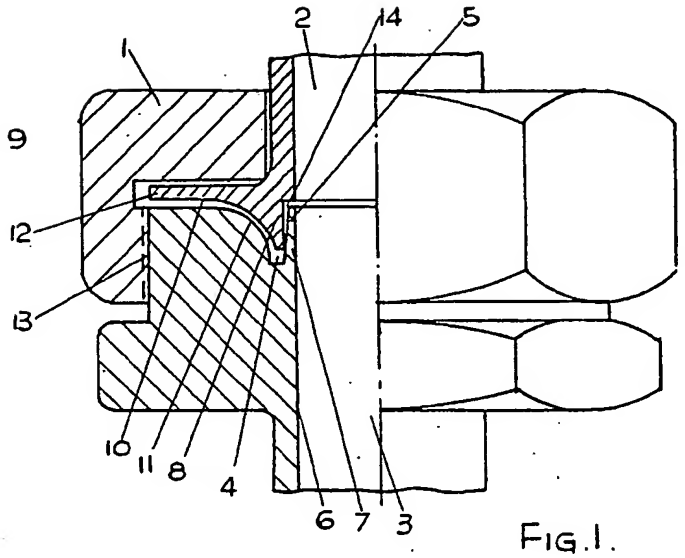

FIG. 1.

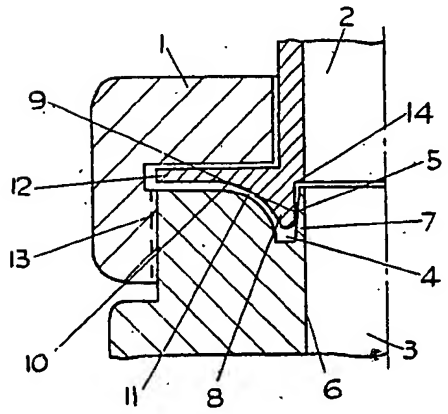

FIG. 2.

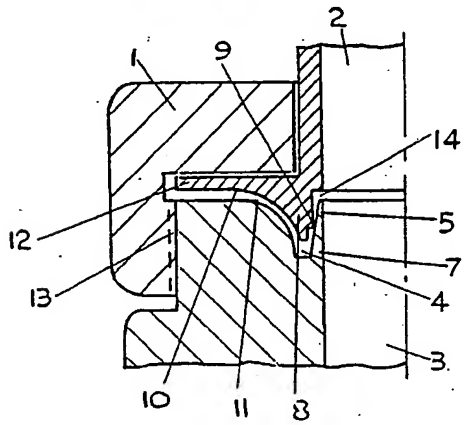

FIG. 3.